



# Analytical Laboratory

Page 1 of 16

13339 Hagers Ferry Road  
Huntersville, NC 28078-7929  
McGuire Nuclear Complex - MG03A2  
Phone: 980-875-5245 Fax: 980-875-4349

## Order Summary Report

**Order Number:** J13050515

Project Name: WWTS FGD-Routine 2013

Customer Name(s): WWTS Bill K, Wayne C, and Melonie M

Customer Address: 3195 Pine Hall Rd  
Mailcode: Belews Steam Station  
Belews Creek, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

**Report Authorized By:** \_\_\_\_\_ **Date:** 6/17/2013  
**(Signature)** Jason C Perkins

### Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

### Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

### Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

*Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)*

### Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013012440	BELEWS	30-May-13 7:30 AM	TO	FGD Purge Eff
2013012441	BELEWS	30-May-13 7:35 AM	TO	EQ Tank Eff
2013012442	BELEWS	30-May-13 7:40 AM	TO	BioReactor 1 Inf
2013012443	BELEWS	30-May-13 7:45 AM	TO	BioReactor 2 Inf
2013012444	BELEWS	30-May-13 7:50 AM	TO	BioReactor 2 Eff
2013012445	BELEWS	30-May-13 8:30 AM	TO	Filter Blk
2013012446	BELEWS	29-May-13 8:00 AM	C.KNOX	TRIP BLANK
7 Total Samples				

## Technical Validation Review

### Checklist:

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).

☒ Yes☐ No

All Results are less than the laboratory reporting limits.

☐ Yes☒ No

All laboratory QA/QC requirements are acceptable.

☒ Yes☐ No

### Report Sections Included:

☒ Job Summary Report☒ Sample Identification☒ Technical Validation of Data Package☒ Analytical Laboratory Certificate of Analysis☐ Analytical Laboratory QC Report☒ Sub-contracted Laboratory Results☐ Customer Specific Data Sheets, Reports, & Documentation☐ Customer Database Entries☒ Chain of Custody☒ Electronic Data Deliverable (EDD) Sent Separately

Reviewed By: DBA Account

Date: 6/14/2013

# Certificate of Laboratory Analysis

Page 4 of 16

*This report shall not be reproduced, except in full.***Order # J13050515**

Site: FGD Purge Eff

Collection Date: 30-May-13 7:30 AM

**Sample #: 2013012440**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>NITRITE + NITRATE (COLORIMETRIC)</u></b>								
Nitrite + Nitrate (Colorimetric)	13	mg-N/L		0.1	10	EPA 353.2	06/03/2013 12:09	BGN9034
<b><u>INORGANIC IONS BY IC</u></b>								
Bromide	110	mg/L		5	50	EPA 300.0	06/03/2013 15:18	JAHERMA
<b><u>MERCURY (COLD VAPOR) IN WATER</u></b>								
Mercury (Hg)	275	ug/L		5	100	EPA 245.1	06/06/2013 14:04	AGIBBS
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	221	mg/L		0.5	10	EPA 200.7	06/06/2013 14:47	MHH7131
<b><u>DISSOLVED METALS BY ICP-MS</u></b>								
Selenium (Se)	144	ug/L		10	10	EPA 200.8	06/12/2013 11:14	KRICHAR
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	215	ug/L		10	10	EPA 200.8	06/12/2013 14:54	KRICHAR
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 14:54	KRICHAR
Chromium (Cr)	256	ug/L		10	10	EPA 200.8	06/12/2013 14:54	KRICHAR
Copper (Cu)	121	ug/L		10	10	EPA 200.8	06/12/2013 14:54	KRICHAR
Nickel (Ni)	214	ug/L		10	10	EPA 200.8	06/12/2013 14:54	KRICHAR
Selenium (Se)	3400	ug/L		10	10	EPA 200.8	06/12/2013 14:54	KRICHAR
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 14:54	KRICHAR
Zinc (Zn)	244	ug/L		10	10	EPA 200.8	06/12/2013 14:54	KRICHAR
<b><u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	Complete					Vendor Method		V_AS&C

Site: EQ Tank Eff

Collection Date: 30-May-13 7:35 AM

**Sample #: 2013012441**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>MERCURY (COLD VAPOR) IN WATER</u></b>								
Mercury (Hg)	65.4	ug/L		2.5	50	EPA 245.1	06/06/2013 14:06	AGIBBS
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	221	mg/L		0.5	10	EPA 200.7	06/06/2013 14:55	MHH7131
<b><u>DISSOLVED METALS BY ICP-MS</u></b>								
Selenium (Se)	95.4	ug/L		10	10	EPA 200.8	06/12/2013 11:17	KRICHAR

# Certificate of Laboratory Analysis

Page 5 of 16

*This report shall not be reproduced, except in full.***Order # J13050515**

Site: EQ Tank Eff

Collection Date: 30-May-13 7:35 AM

**Sample #: 2013012441**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b>TOTAL RECOVERABLE METALS BY ICP-MS</b>								
Arsenic (As)	67.3	ug/L		10	10	EPA 200.8	06/12/2013 14:58	KRICHAR
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 14:58	KRICHAR
Chromium (Cr)	85.5	ug/L		10	10	EPA 200.8	06/12/2013 14:58	KRICHAR
Copper (Cu)	42.4	ug/L		10	10	EPA 200.8	06/12/2013 14:58	KRICHAR
Nickel (Ni)	152	ug/L		10	10	EPA 200.8	06/12/2013 14:58	KRICHAR
Selenium (Se)	1060	ug/L		10	10	EPA 200.8	06/12/2013 14:58	KRICHAR
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 14:58	KRICHAR
Zinc (Zn)	98.8	ug/L		10	10	EPA 200.8	06/12/2013 14:58	KRICHAR

Site: BioReactor 1 Inf

Collection Date: 30-May-13 7:40 AM

**Sample #: 2013012442**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b>NITRITE + NITRATE (COLORIMETRIC)</b>								
Nitrite + Nitrate (Colorimetric)	16	mg-N/L		0.1	10	EPA 353.2	06/03/2013 12:11	BGN9034
<b>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</b>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<b>TOTAL RECOVERABLE METALS BY ICP</b>								
Boron (B)	213	mg/L		0.5	10	EPA 200.7	06/06/2013 14:59	MHH7131
<b>DISSOLVED METALS BY ICP-MS</b>								
Selenium (Se)	67.2	ug/L		10	10	EPA 200.8	06/12/2013 11:20	KRICHAR
<b>TOTAL RECOVERABLE METALS BY ICP-MS</b>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 15:01	KRICHAR
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 15:01	KRICHAR
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 15:01	KRICHAR
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 15:01	KRICHAR
Nickel (Ni)	15.8	ug/L		10	10	EPA 200.8	06/12/2013 15:01	KRICHAR
Selenium (Se)	71.9	ug/L		10	10	EPA 200.8	06/12/2013 15:01	KRICHAR
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 15:01	KRICHAR
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	06/12/2013 15:01	KRICHAR
<b>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</b>								
Vendor Parameter	Complete					Vendor Method		V_AS&C

# Certificate of Laboratory Analysis

Page 6 of 16

*This report shall not be reproduced, except in full.***Order # J13050515**

Site: BioReactor 2 Inf

Collection Date: 30-May-13 7:45 AM

**Sample #: 2013012443**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	<b>Complete</b>	ug/l				Vendor Method		V_AS&C
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	<b>209</b>	mg/L		0.5	10	EPA 200.7	06/06/2013 14:51	MHH7131
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	06/12/2013 15:05	KRICHAR
Cadmium (Cd)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	06/12/2013 15:05	KRICHAR
Chromium (Cr)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	06/12/2013 15:05	KRICHAR
Copper (Cu)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	06/12/2013 15:05	KRICHAR
Nickel (Ni)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	06/12/2013 15:05	KRICHAR
Selenium (Se)	<b>13.3</b>	ug/L		10	10	EPA 200.8	06/12/2013 15:05	KRICHAR
Silver (Ag)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	06/12/2013 15:05	KRICHAR
Zinc (Zn)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	06/12/2013 15:05	KRICHAR

Site: BioReactor 2 Eff

Collection Date: 30-May-13 7:50 AM

**Sample #: 2013012444**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>NITRITE + NITRATE (COLORIMETRIC)</u></b>								
Nitrite + Nitrate (Colorimetric)	<b>&lt; 0.01</b>	mg-N/L		0.01	1	EPA 353.2	06/03/2013 12:12	BGN9034
<b><u>INORGANIC IONS BY IC</u></b>								
Bromide	<b>110</b>	mg/L		5	50	EPA 300.0	06/03/2013 15:36	JAHERMA
<b><u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	<b>Complete</b>	ug/l				Vendor Method		V_AS&C
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	<b>202</b>	mg/L		0.5	10	EPA 200.7	06/06/2013 15:03	MHH7131
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	06/12/2013 15:08	KRICHAR
Cadmium (Cd)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	06/12/2013 15:08	KRICHAR
Chromium (Cr)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	06/12/2013 15:08	KRICHAR
Copper (Cu)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	06/12/2013 15:08	KRICHAR
Nickel (Ni)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	06/12/2013 15:08	KRICHAR
Selenium (Se)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	06/12/2013 15:08	KRICHAR
Silver (Ag)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	06/12/2013 15:08	KRICHAR
Zinc (Zn)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	06/12/2013 15:08	KRICHAR

# Certificate of Laboratory Analysis

Page 7 of 16

*This report shall not be reproduced, except in full.***Order # J13050515**

Site: BioReactor 2 Eff

Collection Date: 30-May-13 7:50 AM

**Sample #: 2013012444**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	Complete					Vendor Method		V_AS&C
<b><u>TOTAL DISSOLVED SOLIDS</u></b>								
TDS	17000	mg/L		25	1	SM2540C	06/03/2013 15:03	JDTALLE

Site: Filter Blk

Collection Date: 30-May-13 8:30 AM

**Sample #: 2013012445**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>DISSOLVED METALS BY ICP-MS</u></b>								
Selenium (Se)	< 1	ug/L		1	1	EPA 200.8	06/12/2013 10:35	KRICHR

Site: TRIP BLANK

Collection Date: 29-May-13 8:00 AM

**Sample #: 2013012446**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	< 0.05	mg/L		0.05	1	EPA 200.7	06/06/2013 14:43	MHH7131
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	< 1	ug/L		1	1	EPA 200.8	06/12/2013 14:51	KRICHR
Cadmium (Cd)	< 1	ug/L		1	1	EPA 200.8	06/12/2013 14:51	KRICHR
Chromium (Cr)	< 1	ug/L		1	1	EPA 200.8	06/12/2013 14:51	KRICHR
Copper (Cu)	< 1	ug/L		1	1	EPA 200.8	06/12/2013 14:51	KRICHR
Nickel (Ni)	< 1	ug/L		1	1	EPA 200.8	06/12/2013 14:51	KRICHR
Selenium (Se)	< 1	ug/L		1	1	EPA 200.8	06/12/2013 14:51	KRICHR
Silver (Ag)	< 1	ug/L		1	1	EPA 200.8	06/12/2013 14:51	KRICHR
Zinc (Zn)	< 1	ug/L		1	1	EPA 200.8	06/12/2013 14:51	KRICHR



**APPLIED SPECIATION  
AND CONSULTING, LLC**

18804 Northcreek Parkway Bothell, WA, 98011  
Tel: (425) 483-3300 Fax: (425) 483-9818  
[www.appliedspeciation.com](http://www.appliedspeciation.com)

June 13, 2013

Jay Perkins  
Duke Energy Analytical Laboratory  
Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd.  
Huntersville, NC 28078  
(704) 875-5245

Project: Belews - FGD WWTS (Bi-Monthly Routine 2013) (LIMS #J13050515)

Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for total mercury and selenium speciation analysis on June 3, 2013. The samples were received in a sealed cooler at 0.3°C on June 4, 2013. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read "Russell Gerads", written over a light blue horizontal line.

Russell Gerads  
Vice President  
Applied Speciation and Consulting, LLC



## Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins  
Duke Energy Analytical Laboratory  
Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd.  
Huntersville, NC 28078

Project: Belews - FGD WWTS (Bi-Monthly Routine 2013) (LIMS #J13050515)

June 13, 2013

## 1. Sample Reception

Three (3) aqueous samples in 125mL HDPE bottles (provided by Applied Speciation and Consulting) were submitted for selenium speciation analysis on June 3, 2013. Three (3) additional samples in 40ml borosilicate glass bottles (provided by Applied Speciation and Consulting) were submitted for total mercury quantitation. All samples were received in acceptable condition on June 4, 2013 in a sealed container at 0.3°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

## 2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

*Selenium Speciation Analysis by IC-ICP-CRC-MS* Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45 $\mu$ m) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

### 3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

*Total Mercury Quantitation by CV-ICP-MS* The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on June 12, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio ( $m/z$ ) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

*Selenium Speciation Analysis by IC-ICP-CRC-MS* Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on June 7, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic ( $\text{pH} > 7$ ) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios ( $m/z$ ). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

#### 4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with these samples were within acceptance limits.

A miscommunication between the ion chromatography unit and the eluent pump caused a delay in the eluent gradient during the analysis of the matrix spike duplicate performed on the sample identified as batch QC. Consequently the retention time for the selenocyanate peak in the matrix spike duplicate sample was shifted to a larger value (from approximately 10.2 minutes to 11.6 minutes). This shift was confirmed by measurement of an internal standard (roxarsone), which typically falls within the same late eluting retention time range. The roxarsone peak experienced a similar retention time shift due to the delay in the eluent gradient. The selenocyanate peak occurring at 11.6 minutes in the matrix spike sample was integrated and the value produced an acceptable selenocyanate recovery.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL for mercury has been calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Russell Gerads', with a stylized, flowing script.

Russell Gerads  
Vice President  
Applied Speciation and Consulting, LLC

Total Mercury & Selenium Speciation Results for Duke Energy  
 Project Name: Belews - FGD WWTS (Bi-Monthly Routine 2013)

Contact: Jay Perkins

LIMS #J13050515

Date: June 13, 2013

Report Generated by: Russell Gerads

Applied Speciation and Consulting, LLC

**Sample Results**

Sample ID	Total Hg	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	98.0	55.3	ND (< 5.0)	ND (< 5.6)	ND (< 5.6)	0 (0)
BioReactor 1 Inf	0.0559	24.4	47.3	ND (< 1.2)	1.5	ND (< 1.4)	0 (0)
BioReactor 2 Inf	0.0123	NR	NR	NR	NR	NR	NR
BioReactor 2 Eff	0.0042	ND (< 1.3)	ND (< 1.6)	ND (< 1.2)	ND (< 1.4)	3.4	0 (0)

All results reflect the applied dilution and are reported in µg/L

NR = Analysis not requested

ND = Not detected at the applied dilution

SeCN = Selenocyanate

MeSe(IV) = Methylseleninic acid

SeMe = Selenomethionine

Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS

n = number of unknown Se species observed

Total Mercury & Selenium Speciation Results for Duke Energy  
 Project Name: Belews - FGD WWTS (Bi-Monthly Routine 2013)

Contact: Jay Perkins

LIMS #J13050515

Date: June 13, 2013

Report Generated by: Russell Gerads  
 Applied Speciation and Consulting, LLC

**Quality Control Summary - Preparation Blank Summary**

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 250x	eMDL 1000x
Hg	0.0005	0.0007	0.0002	0.0009	0.0006	0.0003	0.0002	0.0009	-	-
Se(IV)	0.000	0.000	0.144	0.000	0.036	0.072	0.005	-	1.3	5.4
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.006	-	1.6	6.4
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.005	-	1.2	5.0
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.006	-	1.4	5.6
SeMe	0.000	0.000	0.049	0.000	0.012	0.024	0.006	-	1.4	5.6

eMDL = Estimated Method Detection Limit

\*Please see narrative regarding eMDL calculations

**Quality Control Summary - Certified Reference Materials**

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1617	103.1
Se(IV)	LCS	4.79	5.23	109.2
Se(VI)	LCS	4.74	4.87	102.8
SeCN	LCS	4.46	4.75	106.6
MeSe(IV)	LCS	3.24	3.37	104.1
SeMe	LCS	4.66	4.56	97.9

Total Mercury & Selenium Speciation Results for Duke Energy  
Project Name: Belews - FGD WWTS (Bi-Monthly Routine 2013)

Contact: Jay Perkins

LIMS #J13050515

Date: June 13, 2013

Report Generated by: Russell Gerads  
Applied Speciation and Consulting, LLC

**Quality Control Summary - Matrix Duplicates**

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	BioReactor 2 Eff	0.0042	0.0045	0.0044	6.9
Se(IV)	Batch QC	ND (< 1.3)	ND (< 1.3)	NC	NC
Se(VI)	Batch QC	ND (< 1.6)	ND (< 1.6)	NC	NC
SeCN	Batch QC	ND (< 1.2)	ND (< 1.2)	NC	NC
MeSe(IV)	Batch QC	ND (< 1.4)	ND (< 1.4)	NC	NC
SeMe	Batch QC	ND (< 1.4)	ND (< 1.4)	NC	NC

ND = Not detected at the applied dilution

NC = Value was not calculated due to one or more concentrations below the eMDL

**Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate**

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	BioReactor 2 Eff	2.000	2.087	104.1	2.000	2.116	105.6	1.4
Se(IV)	Batch QC	1390	1535	110.4	1390	1530	110.1	0.3
Se(VI)	Batch QC	1261	1377	109.2	1261	1358	107.7	1.4
SeCN *	Batch QC	1144	1232	107.7	1144	1222	106.9	0.8

\* Please see narrative regarding MSD selenocyanate result.



# CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



**Duke Energy Analytical Laboratory**  
 Mail Code MGO3A2 (Building 7405)  
 13339 Heggers Ferry Rd  
 Huntersville, N. C. 28078  
 (704) 875-5245  
 Fax: (704) 875-4349

1) Project Name: **Belews - FGD**  
 2) Client: **WWTS (Bi-Monthly Routine 2013)**  
 3) Business Unit: **Bill Kennedy, Melonie Martin, Wayne Chapman**  
 4) Process: **20003**  
 5) Res. Type: **BC00**  
 6) Process: **BMCEFGD**  
 7) Res. Type: **10/Reso. Center.**

ORDER# **J13050515**  
 Logged By **RHB**  
 Date & Time **5/31/13 0934**  
 MATRIX: OTHER  
 Samples Originating From **Water**  
 SAMPLE PROGRAM **Ground NPDES Drinking Water**  
 NC **2.0**  
 SC **AS&C**  
 PO# **133241**

1) Lab ID	2) Sample Description or ID	3) Date	4) Time	5) Signature	6) 17 Comp.	7) 18 Grab	8) 19 Analyses	9) 20 TDS	10) 21 Metals* + Hg 245.1**	11) 22 Se (IMS), filtered	12) 23 Hg 200.8 (V AS&C)	13) 24 Se, speciation - vendor to bottle back into both baggies
2013012440	FGD Purge Eff	5-30	0730	CP					1	1	1	1
2013012441	EQ Tank Eff.	5-30	0735	CP					1	1	1	1
2013012442	BioReactor 1 Inf	5-30	0740	CP					1**	1	1	1
2013012443	BioReactor 2 Inf	5-30	0745	TO					1**	1	1	1
2013012444	BioReactor 2 Eff	5-30	0750	TO					1	1	1	1
2013012445	Filter Blk	5-30	0830	TO						1		
2013012446	Metals Trip Blk	5-29	0800	CPHNOV					1**			

Filtering of the Se is performed in the field please provide a filter blank too.

Return Kit to Travis Thorton @ Belews

1) Relinquished By: **CP** Date/Time: **5/30 14:00**  
 2) Accepted By: **COURIER** Date/Time: **5/30 14:00**  
 3) Relinquished By: **COURIER** Date/Time: **5/31/13 0930**  
 4) Accepted By: **CP** Date/Time: **5/31/13 0930**  
 5) Relinquished By: **CP** Date/Time: **5/31/13 0930**  
 6) Accepted By: **Dary Collins** Date/Time: **6/4/13 7:30 AM**  
 7) Relinquished By: **CP** Date/Time: **6/3/13 1300**  
 8) Accepted By: **CP** Date/Time: **6/3/13 1300**  
 9) Relinquished By: **CP** Date/Time: **6/3/13 1300**  
 10) Accepted By: **CP** Date/Time: **6/3/13 1300**  
 11) Seal/Lock Opened By: **CP** Date/Time: **6/3/13 1300**  
 12) Seal/Lock Opened By: **CP** Date/Time: **6/3/13 1300**

Customer, IMPORTANT! Please indicate desired turnaround.  
 22) Requested Turnaround  
 21 Days \_\_\_\_\_  
 7 Days \_\_\_\_\_  
 48 Hr \_\_\_\_\_  
 \*Other \_\_\_\_\_  
 \*Add. Cost Will Apply \_\_\_\_\_  
**6-17-13**

\* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1\*\*=No Hg



# CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



## Duke Energy Analytical Laboratory

Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd  
Huntersville, N. C. 28078  
(704) 875-5245  
Fax: (704) 875-4349

## Analytical Laboratory Use Only

ORDER# <b>J13050515</b>	MATRIX: OTHER	Samples Originating From NC SC
Logged By <b>RIP</b>	Date & Time <b>5/31/13 0934</b>	SAMPLE PROGRAM Water Ground NPDES Drinking Water UST RCRA Waste
AS&C PO#133241		Cooler Temp (C) <b>2.0</b>
MR #		15 Preserv.: 1=HCL 2=H2SO4 3=HNO3 4=Ice 5=None

19 Page 1 Page 2  
Page 16 of 16  
DISTRIBUTION  
ORIGINAL to LAB,  
COPY to CLIENT

1) Project Name <b>Belews - FGD WWTs (Bi-Monthly Routine 2013)</b>		2) Phone No:
2) Client: <b>Bill Kennedy, Melonie Martin, Wayne Chapman</b>		4) Fax No:
5) Business Unit: <b>20003</b>	6) Process: <b>BMCEFGD</b>	Mail Code:
8) Oper. Unit: <b>BC00</b>	9) Res. Type:	10) Reso. Center:

Customer to complete all  
appropriate non-shaded areas.

Sampling conducted: 2nd and 4th Wednesday

LAB USE ONLY
11 Lab ID
2013012440
2013012441
2013012442
2013
2013012443
2013012444
2013012445
2013012446

Customer to complete appropriate columns to right

Se Speciation Bottle ID	13 Sample Description or ID	Date	Time	Signature	17 Comp.	18 Grab	TDS	Br (Dionex)	Metals* + Hg 245.1**	Se (IMS), filtered	NO3-NO2	Hg 200.8 (V_AS&C)	Se, speciation - vendor to AS&C (important to place filled bottle back into both baggies)
	FGD Purge Eff	5-30	0730	<i>TO</i>				1	1	1	1		1
	EQ Tank Eff.	5-30	0735	<i>TO</i>					1	1			
	BioReactor 1 Inf	5-30	0740	<i>TO</i>					1**	1	1	1	1
	BioReactor 2 Inf	5-30	0745	<i>TO</i>					1**			1	
	BioReactor 2 Eff	5-30	0750	<i>TO</i>			1	1	1**		1	1	1
	Filter Blk	5-30	0830	<i>TO</i>						1			
	Metals Trip Blk	5-29	0800	<i>cpk not</i>					1**				

Filtering of the Se is performed in the field please provide a filter blank too.

Return Kit to Travis Thorton @ Belews

1) Relinquished By <i>[Signature]</i>	Date/Time <b>5/30 14:00</b>	2) Accepted By <i>COURIER</i>	Date/Time <b>5/30/13</b>
3) Relinquished By <i>COURIER</i>	Date/Time <b>5/31/13 0936</b>	4) Accepted By <i>R. Davis</i>	Date/Time <b>5/31/13 0936</b>
5) Relinquished By	Date/Time	6) Accepted By	Date/Time
7) Relinquished By <i>R. Davis</i>	Date/Time <b>6/3/13 1300</b>	8) Accepted By	Date/Time
9) Seal/Locked By <i>R. Davis</i>	Date/Time <b>6/3/13 1300</b>	10) Seal/Lock Opened By	Date/Time
11) Seal/Locked By	Date/Time	12) Seal/Lock Opened By	Date/Time

Customer, IMPORTANT!  
Please indicate desired turnaround.

## 22 Requested Turnaround

21 Days \_\_\_\_\_

\*7 Days \_\_\_\_\_

\*48 Hr \_\_\_\_\_

\*Other \_\_\_\_\_

\* Add. Cost Will Apply

**6-17-13**

\* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1\*\*=No Hg